

October 2002
CONDITIONAL SHORT-TERM USE DESIGNATION
for the StormFilter

<u>Applicant:</u>	Stormwater Management, Inc., (SMI), Manufacturer and Vendor James H. Lenhart, PE, V.P. of Research and Development (Responsible Corporate Officer), (800) 548-4667
<u>Address of Applicant:</u>	12021-B NE Airport Way Portland, OR 97220
<u>Application Documents:</u>	January 29, 2002 Letter from Mr. Lenhart July 31, 2002 Letter from Mr. Lenhart January 2002 Report: "Stormwater Management StormFilter Interim Short-Term Use Application for Basic Treatment in Western Washington" August 1, 2002 Report: "Conditional Short Term Use Designation Addendum"
<u>Applicant's Use Level Request</u>	Interim short-term use designation for basic treatment in accordance with Ecology's 2001 Stormwater Manual (SMI January 29, 2002 letter)
<u>Applicant's Performance Claims</u>	A high expectation that the designs outlined in the conditional designation application will result in performance characteristics that will meet or exceed the water quality goals for basic treatment (and enhanced treatment) recently established by Ecology. (SMI July 31, 2002 letter)
<u>Ecology Decision:</u>	<i>Based on SMI's application submissions and recommendations by the Technical Review Committee (TRC) Ecology is hereby issuing a Conditional Short-Term Use Designation for the SMI StormFilter as a Basic stormwater treatment for Total Suspended Solids (TSS) removal. This designation expires on December 31, 2004, unless extended by Ecology, and is subject to the conditions specified below.</i>
<u>Technical Review Committee Finding:</u>	<i>The TRC finds sufficient evidence that SMI should be able to demonstrate, through additional laboratory and field testing, that the StormFilter can attain Ecology's Basic Treatment goals.</i>

Findings of Fact:

1. A StormFilter containing coarse perlite and laboratory-tested at 15 gallons per minute (gpm) averaged 79% TSS removal. The influent TSS consisted of sandy loam soil (45% by mass less than 50 microns). Testing was conducted at TSS concentrations up to 301 mg/L.
2. A StormFilter containing a coarse/fine perlite mix and laboratory-tested at 7.5 gpm averaged 71% TSS removal. The influent TSS consisted of silt loam soil (85% by mass less than 50 microns). Testing was conducted at TSS concentrations up to 247 mg/L.
3. A StormFilter containing leaf compost (CSF) media and laboratory-tested at 15 gpm averaged 70% TSS removal. The influent TSS consisted of sediment composed mainly of silt (60%) and fine-to-medium sand (30%).
4. A StormFilter containing a coarse perlite and laboratory-tested at 7.5 gpm averaged 77% TSS removal. The TSS consisted of Sil-Co-Sil 106 ground silica (a product of U.S. Silica Corporation), with 70% by mass less than 50 microns. Testing was conducted at influent TSS concentrations up to 300 mg/L.
5. StormFilters containing CSF media and field-tested at 15 gpm averaged 73% TSS removal, based on a regression analysis combining field and laboratory data. Most TSS values were below 100 mg/L.
6. SMI provided a design manual, which includes information on selecting, sizing, constructing, and maintaining a StormFilter.
7. SMI provided a list of StormFilter installations in Washington State.
8. SMI provided other supporting information, such as media specifications and warranty information.

Conditions of this Designation:

1. StormFilter systems containing CSF media, fine perlite, or coarse/fine perlite mix are approved for basic treatment at 7.5 gpm maximum flow rate per cartridge at the water quality design flow rate as identified by an acceptable runoff model. This approval applies to land uses where stormwater influent TSS concentrations are expected to be 300 mg/L or less and TSS particle sizes are expected to be similar to those tested. Because the vendor did not provide test results above 300 mg/L TSS, stormwater expected to exceed this concentration (based on land use) must be pretreated to reduce influent TSS concentrations to below 300 mg/L. CSF media can release low amounts of soluble nutrients so it should not be applied in nutrient sensitive discharge areas.
2. StormFilter systems shall be installed in such a manner that flows exceeding 7.5 gpm per cartridge are bypassed around the system or will not resuspend treated sediments. StormFilter systems shall be designed in accordance with the performance goals in Ecology's 2001 Stormwater Manual and SMI's *Product Design Manual Version 3.0* (April 2002), or most current edition, unless otherwise specified. The design, pre-treatment, land use application, and maintenance criteria in SMI's Design Manual must be closely followed.
3. The StormFilter should be designed with a minimum of 2.3 feet of head differential between the invert of the inlet and the invert of the outlet. Backwater can be a problem if downstream hydraulic calculations are not performed properly. Backwater will reduce the hydraulic potential across the filter reducing flow rate through the cartridge. Backwater may also saturate media for long periods of time.

4. Excessive solids, hydrocarbon, and/or debris loading should be addressed by SMI during the design phase to assess if pretreatment is needed, and to determine appropriate inspection and maintenance frequency. Maintenance is crucial to the ongoing effectiveness of the StormFilter so detailed operation and maintenance guidelines must be prepared by SMI for each system.
5. A Quality Assurance Project Plan (QAPP) supporting General Use Level Designation (GULD) testing shall be submitted to Ecology by November 1, 2002.
6. Results of the GULD testing shall be submitted to Ecology by August 1, 2004.
7. This Conditional Short-Term Use designation expires December 31, 2004, unless extended by Ecology.

Remaining Issues or Concerns about this Technology

1. The field data included with the application were given limited weight because they were combined with laboratory data, had low TSS influent values, represent older, no-longer-used system configurations, and/or appeared not to meet many protocol requirements. Most of the field data, however, were used for improving the technology.
2. In the QAPP, SMI should include testing of all media and media combinations they wish to market. Zeolite is commonly used in StormFilters, but no zeolite testing was included with the basic treatment application.
3. In the QAPP, SMI should better define maximum allowable influent TSS and oil concentrations (and any other pollutants that interfere with system performance), above which pretreatment would be required.
4. In the Technology Evaluation Engineering Report (TEER), SMI should provide graphs showing capital (excluding shipping and installation) and O&M costs for a broad range of system sizes, say from 1 to 200 cartridges.
5. In the TEER, SMI should consider whether the StormFilter be also evaluated as an enhanced treatment and phosphorus and oil removal technology.

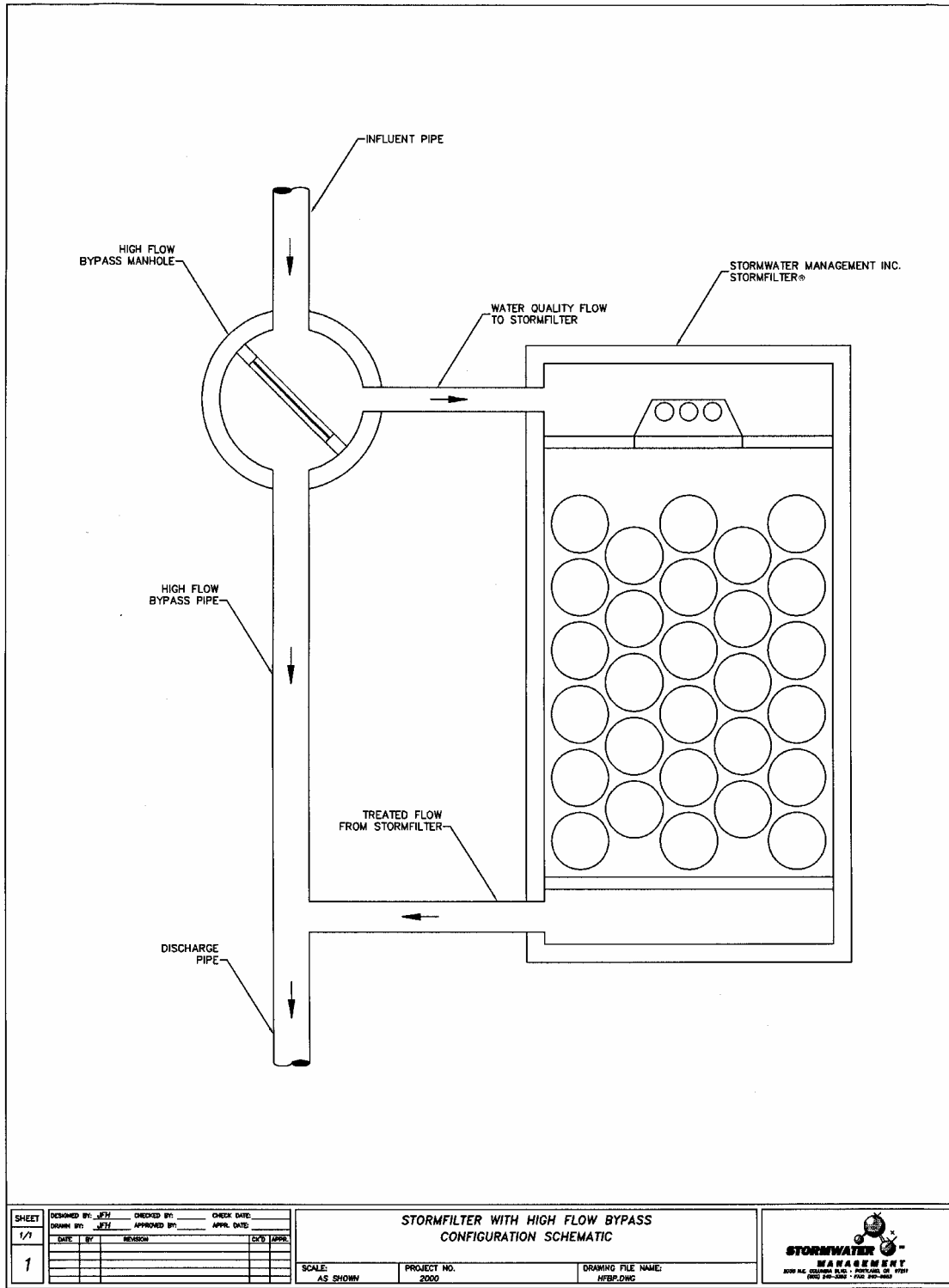
Description of the Technology:

The Stormwater Management StormFilter® (StormFilter), a flow-through stormwater filtration system, improves the quality of stormwater runoff from the urban environment by removing pollutants. The StormFilter is used to treat runoff from a wide variety of sites including, but not limited to: retail and commercial development, residential streets, urban roadways, freeways, and industrial sites such as shipyards, foundries, etc.

OPERATION

The StormFilter is typically comprised of a vault that houses rechargeable, media-filled, filter cartridges. Stormwater from storm drains is percolated through these media-filled cartridges, which trap particulates and may remove pollutants such as dissolved metals, nutrients, and hydrocarbons depending on the medium in the cartridge. During the filtering process, the StormFilter system also removes surface scum and floating oil and grease. Once filtered through the media, the treated stormwater is directed to a collection pipe or discharged to an open channel drainage way. A bypass schematic for flows greater than the water quality design flow rate is shown in Figure 1.

Figure 1. SMI StormFilter Configuration with Bypass



STORMFILTER CONFIGURATIONS

The StormFilter is offered in five basic configurations: precast, linear, catch basin, cast-in-place, and corrugated metal pipe form. The precast, linear, and catch basin models use pre-manufactured units to ease the design and installation process; cast-in-place units are customized for larger flows and may be either uncovered or covered underground units. The corrugated metal pipe units can be customized to meet special site requirements.

The typical precast StormFilter unit is composed of three bays: the inlet bay, the filtration bay, and the outlet bay. Stormwater first enters the inlet bay of the StormFilter vault through the inlet pipe. Stormwater in the inlet bay is then directed through the flow spreader, which traps some floatables, oils, and surface scum, and over the energy dissipater into the filtration bay where treatment will take place. Once in the filtration bay, the stormwater begins to pond and percolate horizontally through the media contained in the StormFilter cartridges. After passing through the media, the treated water in each cartridge collects in the cartridge's center tube from where it is directed into the outlet bay by an under drain manifold. The treated water in the outlet bay is then discharged through the single outlet pipe to a collection pipe or to an open channel drainage way. In some applications where heavy grit loads are anticipated pretreatment by settling may be necessary.

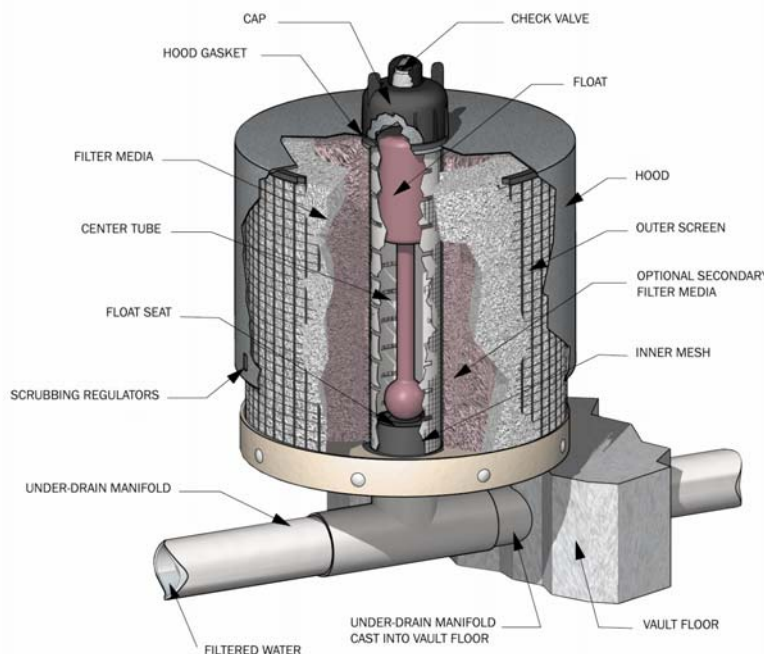


Figure 2. The StormFilter Cartridge

CARTRIDGE OPERATION

As the water level in the filtration bay begins to rise, stormwater enters the StormFilter cartridge. Stormwater in the cartridge percolates horizontally through the filter media and passes into the cartridge's center tube, where the float in the cartridge is in a closed (downward) position. As the water level in the filtration bay continues to rise, more water passes through the filter media and into the cartridge's center tube. The air in the cartridge is displaced by the water and purged from beneath the filter hood through the one-way check valve located in the cap. Once the center tube is filled with water (approximately 18 inches deep), there is enough buoyant force on the float to open

the float valve and allow the treated water to flow into the under drain manifold. As the treated water drains, it tries to pull in air behind it. This causes the check valve to close, initiating a siphon that draws polluted water throughout the full surface area and volume of the filter. Thus, the entire filter cartridge is used to filter water throughout the duration of the storm, regardless of the water surface elevation in the filtration bay. This continues until the water surface elevation drops to the elevation of the scrubbing regulators. At this point, the siphon begins to break and air is quickly drawn beneath the hood through the scrubbing regulators, causing energetic bubbling between the inner surface of the hood and the outer surface of the filter. This bubbling agitates and cleans the surface of the filter, releasing accumulated sediments on the surface, flushing them from beneath the hood, and allowing them to settle to the vault floor.

ADJUSTABLE CARTRIDGE FLOW RATE

Inherent to the design of the StormFilter is the ability to control the individual cartridge flow rate with an orifice control disk placed at the base of the cartridge. Depending on the treatment requirements and on the pollutant characteristics of the influent stream as specified in the SMI Design Manual, the flow rate may be adjusted through the filter cartridges. By decreasing the flow rate through the filter cartridges, the influent contact time with the media is increased and the water velocity through the system is decreased, thus increasing both the level of treatment and the solids removal efficiencies of the filters, respectively (de Ridder, 2002).

For Additional Information:

Applicant e-mail address:	Contact Sean Darcy, seand@stormwaterinc.com (800) 548-4667 or info@stormwaterinc.com
Applicant web link	www.stormwaterinc.org
Ecology web link:	http://www.ecy.wa.gov/programs/wq/stormwater/new_tech/
Ecology Contact:	Stan Ciuba, P.E., Water Quality Program sciu461@ecy.wa.gov (360) 407-6435
Technical Review Committee:	Mark Blosser, P.E., City of Olympia, TRC Chairperson, mblosser@ci.olympia.wa.us (360) 753-8320